

Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) **EP 1 318 321 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
11.06.2003 Bulletin 2003/24

(51) Int Cl.7: **F16D 65/092**

(21) Application number: **02027270.4**

(22) Date of filing: **06.12.2002**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
IE IT LI LU MC NL PT SE SI SK TR**  
Designated Extension States:  
**AL LT LV MK RO**

(72) Inventor: **Aimo, Marco**  
**12061 Carru (IT)**

(74) Representative: **Jorio, Paolo et al**  
**STUDIO TORTA S.r.l.,**  
**Via Viotti, 9**  
**10121 Torino (IT)**

(30) Priority: **07.12.2001 IT TO20011145**

(71) Applicant: **FEDERAL-MOGUL OPERATIONS  
ITALY S.r.l.**  
**12084 Mondovi (IT)**

(54) **Vehicle brake pad, in particular for a railway vehicle**

(57) A vehicle brake pad (1), in particular for a railway vehicle, has a supporting plate (2), and a number of blocks (6, 6a) of friction material fitted to the plate (2) in rest positions distributed over and detached from the plate (2); when braking, each block (6, 6a) is movable, from the rest position, towards the plate (2) in opposition to the thrust exerted by at least one elastic tab (18) formed in one piece with the plate (2).

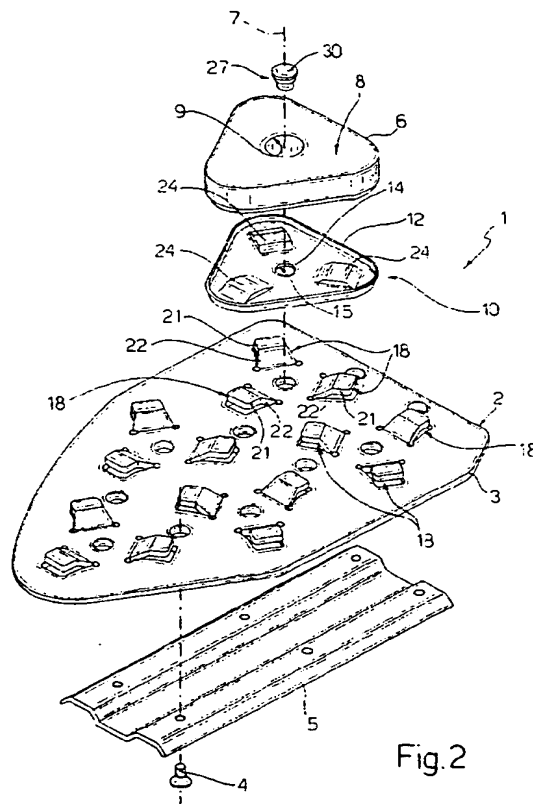


Fig.2

## Description

[0001] The present invention relates to a vehicle brake pad, in particular for a railway vehicle. More specifically, the present invention relates to a brake pad of the type comprising a supporting plate, and a number of blocks of friction material fitted to and detached from the supporting plate.

[0002] A need is felt for a brake pad of the above type, which comprises blocks of friction material movable towards the supporting plate from the rest position when braking, which comprises a relatively small number of component parts, and which provides for balanced, effective braking action while maintaining the blocks of friction material in fixed relative positions.

[0003] It is an object of the present invention to provide a vehicle brake pad, in particular for a railway vehicle, designed to meet the above requirements in a straightforward, low-cost manner.

[0004] According to the present invention, there is provided a vehicle brake pad, in particular for a railway vehicle; the brake pad comprising a supporting plate; a number of blocks of friction material arranged on said supporting plate and cooperating frictionally with a rotary braking member; and connecting means for connecting said blocks to said supporting plate, so that said blocks are maintained in respective rest positions extracted from said supporting plate; characterized in that said connecting means comprise deformable elastic means enabling said blocks to move from said rest positions to respective withdrawn work positions; and retaining means for maintaining said blocks connected to said elastic means at least in said rest positions; said elastic means being formed in one piece with said supporting plate.

[0005] A non-limiting embodiment of the invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a view in perspective of a preferred embodiment of the vehicle brake pad, in particular for a railway vehicle, according to the present invention;

Figure 2 shows an exploded view, with parts removed for clarity, of the Figure 1 brake pad;

Figure 3 shows a larger-scale section of a detail of the brake pad along line III-III in Figure 1;

Figure 4 shows the same view as in Figure 3, of a variation of the Figure 3 detail.

[0006] Number 1 in Figure 1 indicates a brake pad for a vehicle (not shown), in particular a railway vehicle or heavy-duty motor vehicle.

[0007] As shown in Figures 1 and 2, brake pad 1 comprises a plate 2 made of spring metal material, preferably hardened and tempered C70 steel, and in turn comprising a flat portion 3 connected integrally by rivets 4 (only one shown in Figure 2) to a slide 5 for connection

to a brake calliper (not shown).

[0008] Plate 2 supports a number of blocks 6 of friction material, which are arranged on the opposite side of plate 2 to slide 5, are separate from one another, are prismatic in shape with a base in the form of an equilateral triangle with rounded vertices, each have a respective barycentric axis 7 perpendicular to portion 3, and are bounded by respective flat surfaces 8 perpendicular to axes 7 and cooperating frictionally with a brake disk (not shown).

[0009] Each block 6 defines a respective circular through hole 9 extending along axis 7, and is connected to plate 2 by a respective connecting device 10, which maintains block 6 in an extracted rest position - in particular, detached axially from plate 2 - but which, when braking, enables block 6 to move axially, from the rest position, towards plate 2 into a withdrawn work position (shown partly by the dash line in Figure 3).

[0010] As shown in Figures 2 and 3, each device 10 comprises a respective metal wall 12 facing plate 2, and which has the same outer profile as blocks 6, is connected integrally to the base of relative block 6, and comprises an intermediate portion 14 defining a circular hole 15 coaxial with and smaller in diameter than relative hole 9.

[0011] Each device 10 also comprises three elastic tabs 18, which are integral with plate 2, are formed by cutting and bending respective portions of plate 2, are equally spaced angularly about axis 7, and project from portion 3, radially with respect to axis 7 and towards respective rounded vertices of wall 12.

[0012] More specifically, each tab 18 comprises a respective flat end portion 21 parallel to portion 3; and a respective sloping portion 22 attached to portion 3; and portions 21 are housed in respective seats 23 formed in walls 12, to prevent blocks 6 from moving, with respect to plate 2, in directions perpendicular to respective axes 7.

[0013] As shown in Figure 3, seats 23 are defined by respective hollow contoured portions 24 formed close to the rounded vertices of walls 12, are approximately the same size as but no smaller than portions 21, and have respective flat bottom surfaces 25 perpendicular to axis 7. To keep portions 21 resting on surfaces 25, each block 6 is provided with a respective axial retaining and guide pin 27 forming part of device 10, and which comprises a cylindrical intermediate portion 28 engaging hole 15 in axially-sliding manner, and two opposite end portions 29, 30. Portion 29 is fixed axially to portion 3 of plate 2, while portion 30 defines a retaining head housed inside hole 9 and resting axially on portion 14, which is thus interposed axially between head 30 and plate 2.

[0014] Figure 4 shows the same view as in Figure 3, of a variation of brake pad 1, the component parts of which are indicated, where possible, using the same reference numbers as in Figures 1 to 3.

[0015] In the Figure 4 variation, brake pad 1 comprises

es a number of blocks 6a of friction material, which differ from blocks 6 by having no holes 9. Blocks 6a are carried by respective walls 12a, which, unlike walls 12, have no holes 15, and each of which comprises a respective annular end portion 31 projecting radially outwards from relative block 6a. Also, pins 27 in the Figure 1-3 solution are replaced by a single retaining and guide body 33 (shown partly) defined by a plate, which surrounds blocks 6a, comprises a peripheral flange 34 fixed to portion 3 by a number of rivets 35, and has a number of holes 36 (only one of which is shown partly). Holes 36 are complementary in shape to that of blocks 6a, are each engaged in axially-sliding manner by a relative block 6a, and are bounded by respective lateral edges 37 for axially guiding blocks 6a. Portions 31 are interposed axially between body 33 and plate 2, so as to rest axially on edges 37 and keep walls 12a resting on tabs 18 when blocks 6a are in the respective rest positions.

[0016] When braking, the pressure exerted by brake pad 1 on the brake disk elastically deforms tabs 18 to allow blocks 6, 6a to move towards portion 3 of plate 2 independently of one another. Seats 23 retain portions 21 of tabs 18 to prevent blocks 6, 6a from moving in directions perpendicular to respective axes 7, while pins 27 of body 33 guide blocks 6, 6a axially and prevent walls 12, 12a from moving axially away from tabs 18.

[0017] As will be clear from the foregoing description, pad 1 on the one hand, comprises only a small number of component parts, by tabs 18 being formed in one piece with plate 2, and, on the other, provides for balanced effective braking action, by blocks 6, 6a being axially movable to adapt to braking conditions, being independent of one another, and by moving towards plate 2 so that surfaces 8 are coplanar at all times in any position. Braking action is also balanced by the particular triangular shape of blocks 6, 6a and the particular arrangement of tabs 18.

[0018] By virtue of balancing the braking action along surfaces 8, in-service wear of blocks 6, 6a of brake pad 1 is substantially even over surfaces 8.

[0019] Despite the extremely high operating temperatures involved, the rigidity/elasticity characteristics of tabs 18 are excellent and remain unchanged over time, by virtue of the design and arrangement of tabs 18 and the material from which plate 2 is made.

[0020] Clearly, changes may be made to brake pad 1 as described and illustrated herein without, however, departing from the scope of the present invention.

[0021] In particular, the elastic tabs by which blocks 6, 6a are pushed into the respective rest positions may differ in form, location or number from those shown; and blocks 6, 6a may be connected to tabs 18 otherwise than as described and illustrated.

## Claims

1. A vehicle brake pad (1), in particular for a railway

vehicle; the brake pad comprising a supporting plate (2); a number of blocks (6; 6a) of friction material arranged on said supporting plate (2) and co-operating frictionally with a rotary braking member; and connecting means (10) for connecting said blocks (6; 6a) to said supporting plate (2), so that said blocks (6; 6a) are maintained in respective rest positions extracted from said supporting plate (2); **characterized in that** said connecting means (10) comprise deformable elastic means (18) enabling said blocks (6; 6a) to move from said rest positions to respective withdrawn work positions; and retaining means (23, 30; 23, 33) for maintaining said blocks (6; 6a) connected to said elastic means (18) at least in said rest positions; said elastic means (18) being formed in one piece with said supporting plate (2).

2. A brake pad as claimed in Claim 1, **characterized in that** said blocks (6; 6a) are movable independently of one another along respective axes (7) perpendicular to said supporting plate (2); said elastic means (18) comprising, for each said block (6; 6a), at least one respective elastic tab (18) formed in one piece with said supporting plate (2).

3. A brake pad as claimed in Claim 2, **characterized in that** said elastic means (18) comprise at least two said elastic tabs (18) for each said block (6; 6a).

4. A brake pad as claimed in Claim 3, **characterized in that**, for each said block (6; 6a), said retaining means comprise a number of said elastic tabs (18) equally spaced angularly about the relative said axis (7).

5. A brake pad as claimed in any one of Claims 2 to 4, **characterized in that** each said elastic tab (18) is integral with said supporting plate (2) and formed by cutting and bending a relative portion of said supporting plate (2).

6. A brake pad as claimed in any one of Claims 2 to 5, **characterized in that** said connecting means (10) also comprise, for each said block (6; 6a), a respective supporting wall (12; 12a) integral with the block (6; 6a); said retaining means (23, 30; 23, 33) comprising first retaining means (30; 33) carried by said supporting plate (2) to keep said supporting walls (12; 12a) resting axially on said elastic tabs (18) when said blocks (6; 6a) are in said rest positions.

7. A brake pad as claimed in any one of Claims 2 to 6, **characterized in that** said connecting means (10) also comprise guide means (27; 33) carried by said supporting plate (2) to guide each said block (6; 6a) along the relative said axis (7).

8. A brake pad as claimed in Claims 6 and 7, **characterized in that** said first retaining means (30; 33) are carried by said guide means (27; 33).
  
9. A brake pad as claimed in Claim 8, **characterized in that** said guide means (27) comprise, for each said block (6; 6a), a respective axial pin (27) fitted in axially-sliding manner to the relative said supporting wall (12), and terminating with a head (30) located on the opposite axial side of said supporting wall (12) to said supporting plate (2) and defining said first retaining means. 5  
10
  
10. A brake pad as claimed in Claim 8, **characterized in that** said first retaining means (33) comprise a retaining body (33) surrounding said blocks (6a). 15
  
11. A brake pad as claimed in Claim 10, **characterized in that** said retaining body (33) comprises a number of holes (36) engaged in axially-sliding manner by respective said blocks (6a); said supporting walls (12a) comprising respective end portions (31) interposed axially between said supporting plate (2) and said retaining body (33). 20  
25
  
12. A brake pad as claimed in Claim 10 or 11, **characterized by** comprising a number of rivets (35) for connecting a peripheral portion (34) of said retaining body (33) to said supporting plate (2). 30
  
13. A brake pad as claimed in any one of Claims 6 to 12, **characterized in that** said retaining means (23, 30; 23, 33) also comprise second retaining means (23) for preventing each said block (6; 6a) from moving in directions perpendicular to the relative said axis (7). 35
  
14. A brake pad as claimed in Claim 13, **characterized in that** said second retaining means (23) are interposed between said elastic tabs (18) and said blocks (6; 6a). 40
  
15. A brake pad as claimed in Claim 14, **characterized in that** said second retaining means (23) comprise, for each said elastic tab (18), a relative seat (23) formed in the relative said supporting wall (12; 12a) and housing one end (21) of said elastic tab (18). 45
  
16. A brake pad as claimed in any one of the foregoing Claims, **characterized in that** said supporting plate (2) is made of spring steel. 50
  
17. A brake pad as claimed in any one of the foregoing Claims, **characterized in that** each said block (6; 6a) is prismatic in shape, with a triangular base with rounded vertices. 55

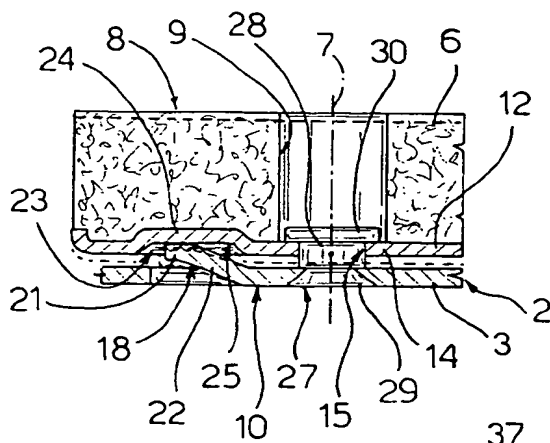
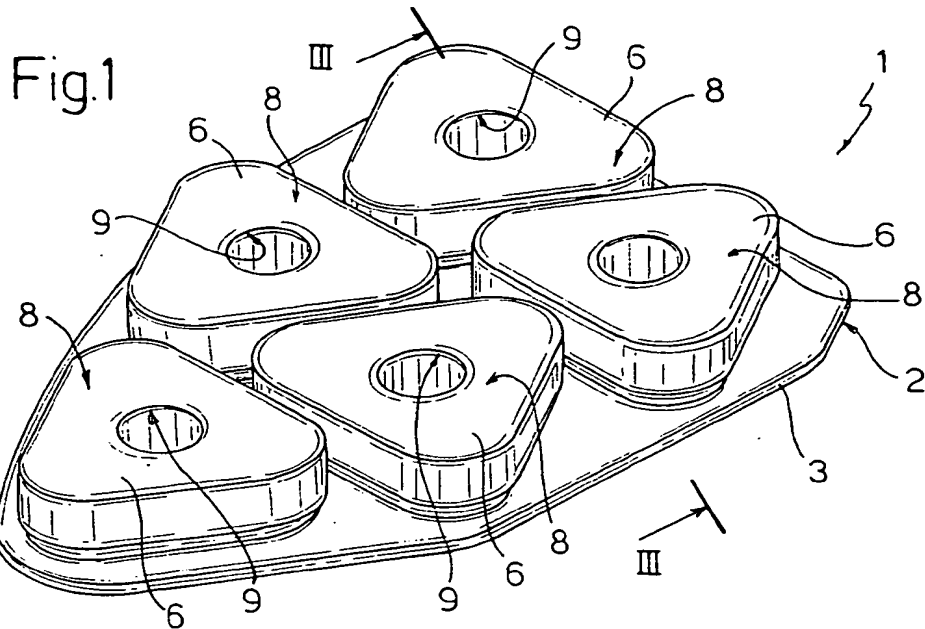


Fig.3

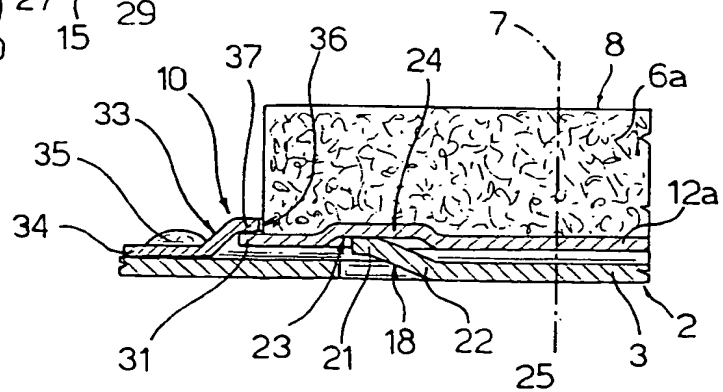
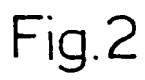


Fig.4





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 02 02 7270

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 934 418 A (WIRTH XAVER) 10 August 1999 (1999-08-10) * column 4, line 44 - line 67; figures 2,3 *	1	F16D65/092
A	DE 198 40 065 A (KNORR BREMSE SYSTEME) 23 March 2000 (2000-03-23) * column 5, line 31 - line 50 * * column 6, line 54 - line 63; figures 2A,2B,6A,6B *	1	
A	EP 0 624 735 A (JURID WERKE GMBH) 17 November 1994 (1994-11-17) * column 4, line 30 - column 5, line 2; figure 3 *	1	
A	DE 298 21 113 U (JURID WERKE GMBH) 18 February 1999 (1999-02-18) * page 5, paragraph 2 - page 6, paragraph 3; figures 1,2 *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F16D
Place of search		Date of completion of the search	Examiner
MUNICH		21 March 2003	Van Koten, G
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 (03.85) (P24C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 02 7270

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-03-2003

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5934418	A	10-08-1999	DE 4436457 A1	18-04-1996
			WO 9612119 A1	25-04-1996
			DE 59504289 D1	24-12-1998
			EP 0784761 A1	23-07-1997
			JP 10507250 T	14-07-1998
DE 19840065	A	23-03-2000	DE 19840065 A1	23-03-2000
			AU 5741299 A	27-03-2000
			WO 0014422 A1	16-03-2000
			EP 1108153 A1	20-06-2001
			JP 2002524699 T	06-08-2002
			US 6494301 B1	17-12-2002
EP 0624735	A	17-11-1994	DE 9307017 U1	15-07-1993
			DE 59400718 D1	31-10-1996
			EP 0624735 A1	17-11-1994
DE 29821113	U	18-02-1999	DE 29821113 U1	18-02-1999

EPC FORM P459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82